

# PATENT ABSTRACTS OF JAPAN

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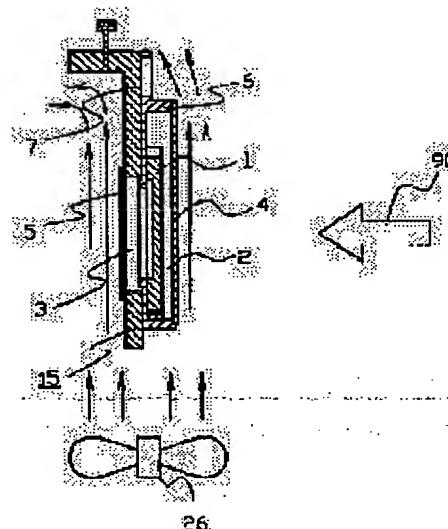
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## (54) DISPLAY DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent temperature rise, to prevent dust and to make a device small in size and compact by putting the incident and emitting surface sides of a liquid crystal display element in hermetically sealed spaces and further connecting them to a wall surface cooling means being other part of the hermetically sealed space.

**SOLUTION:** Since a display picture element area comes in contact with only the hermetically sealed spaces 2 and 3 surrounded by the liquid crystal display element 1, an incident side transparent member 4, an emitting side transparent member 5, a holding frame 6 and a panel plate 7, it does not touch the dust of outside air. A part of heat generated in the element 1 is conducted to the frame 6 and the plate 7 due to heat conduction and transferred to the outside of a liquid crystal display part 15. The rest of the heat is exchanged with gas inside the spaces 2 and 3 and transferred. Namely, a cooling fan 26 exchanges the heat inside the display part 15 consisting of the frame 6, the plate 7 and the members 4 and 5 so as to cool the display part 15. Therefore, the prevention of dust is made compatible with heat radiation and further the entire device is miniaturized by miniaturizing the display part 15.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] In the liquid crystal display which has the cooling fan which cools the light source, a liquid crystal display means to modulate the light from said light source, the delivery system that projects the light modulated from said liquid crystal display means, and said liquid crystal display means Prepare the covering member of the light transmission nature of a glass plate in an optical incidence [ of said liquid crystal display means ], and/or outgoing radiation side, and said covering member minds the attachment component which has opening of an abbreviation square to said liquid crystal display means. The liquid crystal display which sealing maintenance is carried out in the abbreviation airtight condition in internal air, and is characterized by having a cooling means in said attachment component further.

[Claim 2] It is the liquid crystal display characterized by for said cooling means being a heat pipe in a liquid crystal display according to claim 1, and having arranged the cooling section of said heat pipe to said attachment component, and having arranged the radiator of said heat pipe in the direction of antigravity of said attachment component.

[Claim 3] It is the liquid crystal display characterized by the radiator of said heat pipe being a radiation fin in a liquid crystal display according to claim 2.

[Claim 4] It is the liquid crystal display characterized by the radiators of said heat pipe being a heat migration component and a radiation fin in a liquid crystal display according to claim 2.

[Claim 5] It is the liquid crystal display characterized by being the configuration in which the radiator of said heat pipe carried out contact immobilization in the liquid crystal display according to claim 2 at other low-temperature sections.

[Claim 6] It is the liquid crystal display which said cooling means are a heat migration component and a radiator in a liquid crystal display according to claim 1, and is characterized by having arranged the cooling section of said heat migration component to said attachment component.

[Claim 7] It is the liquid crystal display characterized by said cooling means being a radiation fin in a liquid crystal display according to claim 1.

[Claim 8] It is the liquid crystal display which said liquid crystal display means is the configuration fixed to the liquid crystal display by the fixed means in a liquid crystal display according to claim 1, and is characterized by fixing to a fixed means through the attachment component of a liquid crystal display means, or for the attachment component of a liquid crystal display means uniting with a fixed means, and said fixed means becoming.

[Claim 9] The liquid crystal display characterized by the internal air which prepared said covering member in the optical incidence [ of said liquid crystal display means ] and outgoing radiation side, and was maintained at the abbreviation airtight condition in the liquid crystal display according to claim 1 constituting said attachment component in the shape of [ movable to mutual / by the side of said optical incidence and optical outgoing radiation ] a free passage.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] A liquid crystal display component etc. is used for this invention, and it relates to graphic display devices, such as the projection device which projects an image on a screen, for example, liquid crystal projector equipment, and a liquid crystal television, projection display equipment.

[0002]

[Description of the Prior Art] The light from the light source of an electric bulb etc. is applied to display devices, such as a liquid crystal panel, and projection mold graphic display devices, such as a liquid crystal projector which carries out expansion projection of the image on a liquid crystal panel, are known.

[0003] With a liquid crystal display component, the light from the light source is changed into the shade for every pixel, and this kind of display adjusts it, and projects it on a screen etc. Except the part on which it is finally projected, the light which came out of the light source is absorbed by a liquid crystal display component, the optical element of the circumference of it, etc., and serves as heat. For this reason, a liquid crystal display component and its neighborhood will be heated.

[0004] Generally the liquid crystal display component is constituted by the driver element of a semi-conductor, and optical functional materials, such as liquid crystal, and in order to operate all normally, it is necessary to maintain it below at predetermined temperature (for example, 60 etc. degrees C etc.). For this reason, various methods have been applied to cooling of a liquid crystal display component from before.

[0005] Moreover, since expansion projection will be carried out as it is and foreign matters, such as dust which adheres near a liquid crystal display component in order that the optical system to project may connect a focus to the image side of a liquid crystal display component, will be projected as a shadow, the dust prevention method near a liquid crystal display component has been applied variously conventionally.

[0006] First, the example indicated by JP,1-169424,A is known as a conventional technique about cooling of a liquid crystal panel. The liquid is sealed by the cooling box which was united with the liquid crystal panel which is a liquid crystal display component with this conventional technique, and a liquid circulates through generation of heat of a liquid crystal panel, it cools, and heat is radiated to the exterior of a cooling box. When done in this way, the screen of the liquid crystal panel which light penetrates itself was cooled, and it was effective in the dust from the outside not advancing near a panel.

[0007] however, with this conventional technique, it is not fully recognized the point which has a trouble on generating of the liquid spill and air bubbles accompanying expansion and contraction, aging, etc. by the temperature change, and the handling of a series of liquids called lack of the liquid by evaporation about the handling of the liquid for cooling, and conventionally.

[0008] The example indicated by JP,7-152009,A is known considering dust prevention and heat dissipation as a conventional technique about coexistence \*\*\*\*\*, without using a liquid. It places into the space which had the liquid crystal panel which is the liquid crystal display component of a transparency mold sealed with this conventional technique, the air in a closed space is circulated compulsorily and heat is radiated in generation of heat of a liquid crystal panel, and heat exchange of the air inside a closed space is further carried out out of a closed space, and heat is radiated. If it does in this way, it is compatible in protection against dust and heat dissipation. However, with this conventional technique, in order to circulate air compulsorily in a closed space, the point which a closed space itself becomes large, as a result equipment itself enlarges is not fully recognized.

[0009] That is, dust prevention, coexistence of heat dissipation of a liquid crystal panel, and small and miniaturization of the whole equipment are needed.

[0010]

[Problem(s) to be Solved by the Invention] If the technical-problem matter in the above conventional technique is summarized, heat dissipation of liquid crystal display components, such as a liquid crystal panel, and the approach of protection against dust are technical problems, and the method with which the miniaturization of equipment is attained further has been a technical problem.

[0011] In this invention, a temperature rise is prevented about the technical-problem matter in the above-mentioned conventional technique, dust can be prevented and offer of the liquid crystal display in which small and miniaturization are possible is the purpose.

[0012]

[Means for Solving the Problem] In this invention, the liquid crystal display component was surrounded in a closed space, and it constituted as a means which radiates for it heat and cools the wall surface which constitutes a closed space. The liquid crystal display component placed into a closed space does not produce a shadow on an image with dust in order not to touch the dust of the open air. Moreover, generation of heat of a liquid crystal display component radiates heat with the air which convects the inside of a closed space, and is further cooled with cooling / heat dissipation means of a wall surface.

[0013]

[Embodiment of the Invention] Hereafter, the gestalt of operation of the equipment of this invention is described using a drawing.

[0014] Drawing 1 is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 1st 1 operation of this invention, drawing 2 is the perspective view showing the internal configuration of the gestalt of the 1st 1 operation of this invention, and drawing 3 is the perspective view showing the appearance of a closed space in the gestalt of the 1st 1 operation of this invention.

[0015] 1 the display pixel field of the liquid crystal display component 1, and 4 for a liquid crystal display component and 1a An incidence side transparence member, The closed space where 5 was surrounded by the outgoing radiation side transparence member, and 2 was surrounded with the liquid crystal display component 1, the incidence side transparence member 4, and the maintenance frame 6, The panel plate with which 6 is carried out at the maintenance frame of the liquid crystal display component 1 in each part article of the circumference of said liquid crystal display component, and maintenance immobilization of 7 is carried out in the maintenance frame 6 at one, The closed space where 3 was surrounded with the liquid crystal display component 1, the outgoing radiation side transparence member 5, the maintenance frame 6, and the panel plate 7, and 15 are the liquid crystal display sections which consist of these configurations. 26 is a cooling fan made to generate the air convection current for cooling. Moreover, 90 shows the direction of incidence of light.

[0016] The incidence side transparence member 4 and the outgoing radiation side transparence member 5 are formed with translucency ingredients, such as clear glass. The antireflection film may be formed in the front face of the incidence side transparence member 4 and the outgoing radiation side transparence member 5.

[0017] The maintenance frame 6 and the panel plate 7 are formed with the ingredient excellent in the heat transfer nature containing metals, such as Fe, Cu, aluminum, and Mg, and them. Opening of an abbreviation square is prepared in the maintenance frame 6 and the panel plate 7, and the optical path over display pixel field 1a is not interrupted.

[0018] Since display pixel field 1a touches only the closed space 3 and 4 surrounded with the liquid crystal display component 1, the incidence side transparence member 4, the outgoing radiation side transparence member 5, the maintenance frame 6, and the panel plate 7, it does not touch the dust of the open air. Therefore, since dust does not exist near the focusing point field of the incident light study system to the liquid crystal display component 1, the shadow resulting from dust does not arise in an image.

[0019] By contact heat conduction, a part carries out heat exchange of the remaining parts to the gas of a closed space 2 and the 3 interior to a periphery, and the heat generated with the liquid crystal display component 1 is transmitted for it. In heat conduction by contact, heat is transmitted to the maintenance frame 6 and the panel plate 7 out of propagation and the liquid crystal display section 15. The heat which carried out heat exchange to the gas generates a free convection, and it carries out heat transfer to the internal surface of the maintenance frame 6 and the panel plate 7. The maintenance frame 6 and the panel plate 7 have the duty which radiates heat to the closed-space exterior in the transmitted heat. The passage of the air convection current for cooling from a cooling fan 26 is arranged along with the maintenance frame 6 and the panel plate 7, carries out heat exchange of the heat inside [ which consists of the maintenance frame 6, the panel plate 7, an incidence side transparence member 4, and an outgoing radiation side transparence member 5 ] the liquid crystal display section 15, and cools the liquid crystal display section 15. Moreover, although not shown all over drawing, even if there are few maintenance frames 6 or panel plates 7, the radiation fin may be prepared in one of outer walls. In this case, as for a radiation fin, it is desirable to meet the passage of the air convection current for cooling from a cooling fan 26.

[0020] Thereby, the heat generated with the liquid crystal display component 1 radiates heat to the exterior of the liquid crystal display section 15 through the maintenance frame 6 and the panel plate 7.

[0021] Thus, coexistence of dust prevention and heat dissipation and the miniaturization of the whole equipment according to the miniaturization of the liquid crystal display section further are attained.

[0022] The function of the liquid crystal projector which has this invention liquid crystal display section 15 which

consists of the above configuration is explained using drawing 4 .

[0023] Drawing 4 is the schematic diagram showing the whole optical system of the liquid crystal projector of the gestalt of operation of this invention. In drawing 4 , the reflecting mirror which condenses the light in which 30 emitted light from the light source of a metal halide lamp etc., and 31 emitted light from the light source 30 in the fixed direction, and 32 and 33 are the multi-lenses with which many cell lenses gathered. 34-39 are mirror groups which show separation optical system and are divided into the three-primary-colors RGB component of light. The condensing lens with which 40R, 40G, and 40B condense each light of a RGB component for a liquid crystal display component, and 41R, 41G and 41B are an incidence side polarizer and the liquid crystal display section 15 which 15R, 15G, and 15B mentioned above. 42 is synthetic optical system which compounds the RGB component separated according to separation optical system. 43 is a projector lens and 44 is a screen. In this invention liquid crystal projector which consists of the above configuration, the light which carried out outgoing radiation from the light source 30 condenses on the multi-lenses 32 and 33 with a reflecting mirror 31, and goes into the mirror group of separation optical system. These multi-lenses 32 and 33 have the operation in which light carries out incidence to homogeneity even in all the corners of display pixel field 1a of the liquid crystal display component 20, and have the function to attain equalization of an illuminance also in the location of screen 44 throat. It is decomposed into a RGB component by the separation optical system 34-39, and the light which passed through this multi-lens goes into each liquid crystal display section 15R, 15G, and 15B via condensing lenses 40R, 40G, and 40B and the incidence side polarizers 41R, 41G, and 41B. The light of each RGB component changed and adjusted to the shade for every pixel in this liquid crystal display section displays image information on a screen 44 through a projector lens 43, after being compounded in the synthetic optical system 42.

[0024] Drawing 5 is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 2nd 1 operation of this invention, drawing 6 is the perspective view showing the internal configuration of the gestalt of the 2nd 1 operation of this invention, and drawing 7 is the perspective view showing the appearance of a closed space in the gestalt of the 2nd 1 operation of this invention.

[0025] It is the liquid crystal display section which a heat pipe and 51 become in the closed space where the display pixel field of the liquid crystal display component 1 and 4 were surrounded by the incidence side transparence member, and 2 was surrounded [ 1 ] for a liquid crystal display component and 1a with the liquid crystal display component 1, the incidence side transparence member, and the maintenance frame 52, and 50, and the maintenance frame of the liquid crystal display component 1 and 15 become from these liquid crystal display component 1, a closed space 2, the incidence side transparence member 4, and the maintenance frame 52 in a radiation fin and 52. 26 is a cooling fan made to generate the air convection current for cooling. Moreover, 90 shows the direction of incidence of light.

[0026] It contact-fixes, or it unifies, a heat pipe 50 is arranged at the maintenance frame 52, and the point that the gestalt of the 2nd operation of this invention differs from the gestalt of the 1st operation is in the point that the maintenance frame 52 is cooled by heat transfer to a heat pipe 50. Some heat pipes [ at least ] 50 are arranged in the direction of antigravity of the maintenance frame 52, and the heat dissipation means of a heat pipe 50 is established here. In drawing 5 -7, as a heat dissipation means of a heat pipe 50, it is contact-fixed or the radiation fin 51 is unified.

[0027] Although it is shown as if the heat fin 51 intersected perpendicularly in the air convection-current direction for cooling in drawing 5 for explanation, an actual radiation fin is arranged in the air convection-current direction for cooling like drawing 6 at parallel (a drawing and right angle). In addition to this, the heat dissipation means of a heat pipe 50 may be a heat migration component (for example, Peltier device), or may combine a heat migration component and a radiation fin. Moreover, contact immobilization may be carried out from the liquid crystal display section 15 at a low-temperature configuration member among other configuration members of the equipment with which the liquid crystal display section 15 is used.

[0028] With the gestalt of the 2nd 1 operation of this invention, the plane-of-incidence side of display pixel field 1a is in contact with the closed space 2 surrounded with the liquid crystal display component 1, the incidence side transparence member 4, and the maintenance frame 52.

[0029] By contact heat conduction, a part carries out heat exchange of the remaining parts to the gas of the closed-space 2 interior to a periphery, and the heat generated with the liquid crystal display component 1 is transmitted for it. In heat conduction by contact, heat is transmitted to the maintenance frame 52 out of propagation and the liquid crystal display section 15. The heat which carried out heat exchange to the gas generates a free convection, it carries out heat exchange to the maintenance frame 52 again, and it is transmitted to the maintenance frame 52. On the other hand, the outgoing radiation side side of display pixel field 1a touches

the open air, and radiates heat by the air convection current for cooling generated with a cooling fan 26. Although possibility that dust will adhere to the outgoing radiation side side of display pixel field 1a arises, the shadow of dust does not arise on an image by taking the focusing point location of an incident light study system to the plane-of-incidence side of the liquid crystal display component 1. Of course, a closed space 2 is established in the plane-of-incidence side, and dust does not adhere.

[0030] With the gestalt of this 2nd 1 operation, since heat can be radiated in the location which is distant from the liquid crystal display section 15 by going via a heat pipe, it is effective in the ability to improve the refrigeration capacity to the increase of a degree of freedom over a heat dissipation means, and the liquid crystal display section 15.

[0031] Although the closed space which touches display pixel field 1a was established in the plane-of-incidence side with the gestalt of this 2nd 1 operation, what established a closed space in the outgoing radiation side side, and took the focusing point location of an incident light study system to the outgoing radiation side side of the liquid crystal display component 1 may be used. Moreover, you may prepare in close outgoing radiation side side both sides.

[0032] Drawing 8 is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 3rd 1 operation of this invention.

[0033] It is the liquid crystal display section which the maintenance frame of the liquid crystal display component 1 and 60 become in the closed space where a liquid crystal display component and 4 were surrounded by the incidence side transparence member, and 2 was surrounded for 1 with the liquid crystal display component 1, the incidence side transparence member, and the maintenance frame 52, and 52, and a radiation fin and 15 become from these liquid crystal display component 1, a closed space 2, the incidence side transparence member 4, and the maintenance frame 52 in a heat migration component and 61. 26 is a cooling fan made to generate the air convection current for cooling. Moreover, 90 shows the direction of incidence of light. A Peltier device is used for the heat migration component 60.

[0034] Contact immobilization of the point that the gestalt of the 3rd 1 operation of this invention differs from the gestalt of the 1 or 2nd operation is carried out at the maintenance frame 52, and the heat migration component 60 electrically controlled by the means which is not illustrated has the heat migration component 60 in endoergic and the point of performing actuation which radiates heat from the opposite side, from a maintenance frame 52 contact-surface side. Contact immobilization of the radiation fin 61 is carried out at the heat sinking plane side of the heat migration component 60.

[0035] By contact heat conduction, a part carries out heat exchange of the remaining parts to the gas of the closed-space 2 interior to a periphery, and the heat generated with the liquid crystal display component 1 is transmitted for it. In heat conduction by contact, heat is transmitted to the maintenance frame 52 out of propagation and the liquid crystal display section 15. The heat which carried out heat exchange to the gas generates a free convection, it carries out heat exchange to the maintenance frame 52 again, and it is told to the maintenance frame 52. The heat of the maintenance frame 52 is transmitted to other structural members which a part contacts, and through the heat migration component 60, a part is transmitted to a radiation fin 61 and radiates heat.

[0036] Although it is shown as if the radiation fin 61 intersected perpendicularly in the air convection-current direction for cooling in drawing 8 for explanation, an actual radiation fin is arranged in the air convection-current direction for cooling at parallel (a drawing and right angle).

[0037] According to the gestalt of this operation, since many heating values are transmitted to the heat migration component 60 rather than it carries out directly to the air convection current for cooling by receiving endoergic from the heat migration component 60 contact surface, the maintenance frame 52 is effective in the ability to improve the refrigeration capacity to the liquid crystal display section 15.

[0038] Drawing 9 is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 4th 1 operation of this invention.

[0039] The transparence member maintenance frame with which, as for 71, the closed space where an incidence side transparence member and 5 were surrounded by the outgoing radiation side transparence member, and 2 was surrounded [ 1 ] for a liquid crystal display component and 4 with the liquid crystal display component 1, the incidence side transparence member 4, the maintenance frame 6, and the transparence member maintenance frame 71, and 6 carry out arrangement immobilization of the incidence side transparence member 4 to the maintenance frame 6, and 15 are the liquid crystal display sections which consist of these configurations to the maintenance frame of the liquid crystal display component 1. Moreover, 90 shows the direction of incidence of

light.

[0040] In explanation of drawing 9 - drawing 11 , since it is the same as that of the above-mentioned gestalt of operation, the cooling fan for causing the air convection current for cooling on the outside of the liquid crystal display section has been omitted.

[0041] The point that the gestalt of this 4th 1 operation differs from the gestalt of the 1-3rd operations is in the point that the transparence member maintenance frame 71 radiates heat outside in the heat from a closed space 2, and functions as a cooler style while the incidence side transparence member 4 opens a gap and arrangement immobilization is carried out to the maintenance frame 6 with the transparence member maintenance frame 71. The transparence member maintenance frame 71 is formed with the ingredient containing metals, such as Fe, Cu, aluminum, and Mg, and them. The transparence member maintenance frame 71 is fabricated by the spinning by the press. To the transparence member maintenance frame 71, it turns abbreviation 1 from the incidence side transparence member 4 to hold; small opening is prepared in it, and the optical path over the display pixel field of the liquid crystal display component 1 is not barred in it.

[0042] According to the gestalt of this operation, it becomes unnecessary to prepare the structure for maintaining the gap of the incidence side transparence member 4 and the liquid crystal display component 1 at the maintenance frame 6, and the structure of the maintenance frame 6 is simplified.

[0043] Drawing 10 is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 5th operation of this invention.

[0044] The closed space where an incidence side transparence member and 5 were surrounded by the outgoing radiation side transparence member, and 2 was surrounded [ 1 ] for a liquid crystal display component and 4 with the transparence members 4 and 5, the maintenance frame 6, and the transparence member maintenance frame 71, A structural member for the transparence member maintenance frame with which 71 carries out arrangement immobilization of the incidence side transparence member 4 to the maintenance frame 6 in 6, and 73 to float the liquid crystal display component 1 from the maintenance frame 6 to the maintenance frame of the liquid crystal display component 1, and 15 are the liquid crystal display sections which consist of these configurations. Moreover, 90 shows the direction of incidence of light.

[0045] The point that the gestalt of this operation differs from the gestalt of the 1-4th operations has taken the structure in which a part of liquid crystal display component [ at least ] 1 opened the gap to the maintenance frame 6 by the structural member 73, and is in the point that the convection current of the gas which touches the close outgoing radiation side of the liquid crystal display component 1 is attained. The structural member 73 could be formed in the front face of the maintenance frame 6 or the liquid crystal display component 1.

[0046] According to the gestalt of this operation, a liquid crystal display component can be effectively cooled by the gas which touches close outgoing radiation side both sides of a liquid crystal display component convecting.

[0047] Drawing 11 is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 6th operation of this invention.

[0048] The transparence member maintenance frame with which, as for the maintenance frame of the liquid crystal display component 1 and 72, the closed space where an incidence side transparence member and 5 were surrounded by the outgoing radiation side transparence member, and 2 was surrounded [ 1 ] for a liquid crystal display component and 4 with the transparence members 4 and 5, the maintenance frame 6, and the transparence member maintenance frames 71 and 72, and 6 carry out arrangement immobilization of the transparence members 4 and 5 to the maintenance frame 6, and 15 are the liquid crystal display sections which consist of these configurations to 71. Moreover, 90 shows the direction of incidence of light.

[0049] Opening for closure gas ventilation is prepared in the maintenance frame 6, the incidence side seal space of the maintenance frame 6 and outgoing radiation side seal space are connected, and the point that the gestalt of this operation differs from the gestalt of the 1-5th operations is in the point whose convection current is attained.

[0050] According to the gestalt of this operation, by the gas which touches close outgoing radiation side both sides of a liquid crystal display component convecting, a liquid crystal display component can be cooled effectively, and structure can be simplified.

[0051] Moreover, in drawing 11 , the transparence members 4 and 5 are arranged to the transparence member maintenance frames 71 and 72 at the maintenance frame 6 side. Thereby, the open air touch area of the transparence member maintenance frames 71 and 72 increases.

[0052] Compared with the transparence member maintenance frame which the clear glass used for a transparence member and translucency organic resin consist of with a metal etc., since a heat transfer rate is



very small, the transparen member of the contribution to heat dissipation is small compared with a transparen member maintenance frame. Therefore, the effectiveness that refrigeration capacity improves is acquired by increasing the open air touch area of the transparen member maintenance frames 71 and 72, [0053]. Although it is what used the polarization mold liquid crystal panel method and being explained as a liquid crystal display means with the above-mentioned gestalt of operation, even if it is the liquid crystal display component of other gestalten, for example, a dispersion mold liquid crystal panel method, a micro mirror (very small mirror drive) method, a laser liquid crystal write-in method, etc., it cannot be overemphasized that there is same effectiveness. moreover -- although explained to optical system using the dioptric lens -- the optical elements, for example, the reflecting mirror lens, other than a dioptric lens -- also using -- even if it is alike or uses the combination of a dioptric lens and a reflecting mirror lens etc., it cannot be overemphasized that the same effectiveness can be acquired.

[0054]

[Effect of the Invention] As mentioned above, as explained, the heat generated for a liquid crystal display means since the close outgoing radiation side side of a liquid crystal display component was set to a closed space and it connected with the remaining wall surface cooling means of a closed space further in the liquid crystal display of this invention can be cooled efficiently, and it is effective in the ability to prevent penetration of the dust from the closed-space outside further.

[0055] Moreover, since a closed space can be constituted small, it also has the effectiveness that small and miniaturization of equipment are attained.

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**DESCRIPTION OF DRAWINGS**

**[Brief Description of the Drawings]**

[Drawing 1] It is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 1st operation of this invention.

[Drawing 2] It is the perspective view showing the internal configuration of the gestalt of the 1st operation of this invention.

[Drawing 3] It is the perspective view showing the appearance of a closed space in the gestalt of the 1st operation of this invention.

[Drawing 4] It is the schematic diagram showing the whole optical system of the liquid crystal projector of the gestalt of operation of this invention.

[Drawing 5] It is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 2nd operation of this invention.

[Drawing 6] It is the perspective view showing the internal configuration of the gestalt of the 2nd operation of this invention.

[Drawing 7] It is the perspective view showing the appearance of a closed space in the gestalt of the 2nd operation of this invention.

[Drawing 8] It is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 3rd operation of this invention.

[Drawing 9] It is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 4th operation of this invention.

[Drawing 10] It is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 5th operation of this invention.

[Drawing 11] It is the sectional view showing the example of each part configuration of the liquid crystal display section in the gestalt of the 6th operation of this invention.

[Description of Notations]

1 — A liquid crystal display component, 1a — Display pixel fields 4 and 5 of the liquid crystal display component 1 — Transparence member, 2 3 — 6 A closed space, 52 — A maintenance frame, 7 — 15 A panel plate, 15R, 15G, 15B — The liquid crystal display section, 26 — A cooling fan, 90 — The direction of incidence of light; 30 [ — Separation optical system, ] — The light source, 31 — 32 A reflecting mirror, 33 — A multi-lens, 34-39 40R, 40G, 40B — A condensing lens, 41R, 41G, 41B — Incidence side polarizer, 42 [ — 51 A heat pipe, 61 / — A radiation fin, 60 / — 71 A heat migration component, 72 / — A transparence member maintenance frame, 73 / — Structural member for floating a liquid crystal display component from a maintenance frame. ] — Synthetic optical system, 43 — A projector lens, 44 — A screen, 50

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[Translation done.]